

## Effects of Gestational Diabetes Mellitus on Maternal Health Outcomes

Jaya Apawat<sup>1</sup>, Meenakshi Samaria<sup>2</sup>

<sup>1</sup>PG 2nd Year Resident, Department of Obstetrics & Gynaecology, Jawaharlal Nehru Medical College, Ajmer, Rajasthan, India

<sup>2</sup>Professor, Department of Obstetrics & Gynaecology, Jawaharlal Nehru Medical College, Ajmer, Rajasthan, India

---

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 20-04-2024

Corresponding Author: Dr. Meenakshi Samaria

Conflict of interest: Nil

---

### Abstract:

**Objective:** This study aims to evaluate the impact of gestational diabetes mellitus (GDM) on maternal health outcomes.

**Methods:** A prospective study was conducted with 200 pregnant women diagnosed with GDM at RMC Ajmer over a year. Participants were categorized into controlled and uncontrolled GDM groups. Data on demographics, obstetric outcomes, and long-term health were collected and analyzed.

**Results:** Women with uncontrolled GDM exhibited higher rates of cesarean delivery (60% vs. 35%), hypertensive disorders (30% vs. 10%), and postpartum complications. Six months postpartum, 25% of women showed impaired glucose tolerance, and 10% were diagnosed with type 2 diabetes, predominantly in the uncontrolled group. Key adverse outcome predictors included poor glucose control, obesity, and a family history of diabetes.

**Conclusion:** GDM significantly affects maternal health, with uncontrolled GDM leading to more complications. Effective management and postpartum follow-up are essential to improve outcomes. Public health strategies should focus on early screening and personalized care to mitigate GDM effects.

**Keywords:** Gestational Diabetes Mellitus (GDM), Maternal Health Outcomes, Obstetric Complications, Long-term Health Risks.

---

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

---

### Introduction

Gestational diabetes mellitus (GDM) is characterized by glucose intolerance first identified during pregnancy. It is a significant health concern, impacting numerous pregnant women globally [1]. Factors such as age, ethnicity, obesity, and genetics influence its prevalence. GDM is generally diagnosed through routine second-trimester screening, although high-risk women may be tested earlier [2].

GDM presents multiple health challenges for both mother and fetus. For mothers, it can result in complications like hypertensive disorders (including preeclampsia) and an increased likelihood of cesarean delivery. Additionally, women with GDM face a higher risk of developing type 2 diabetes later in life and may experience recurrent GDM in subsequent pregnancies [3].

Postpartum, women who had GDM are at increased risk of metabolic syndrome, cardiovascular diseases, and impaired glucose tolerance. These long-term health issues necessitate ongoing medical monitoring and lifestyle interventions. Effective GDM management, involving diet, exercise, and sometimes medication, is crucial for

enhancing maternal health outcomes and preventing adverse effects [4].

For fetal outcomes, GDM can cause macrosomia, leading to higher birth injury risks and delivery complications. Infants born to GDM mothers are also at risk for hypoglycemia, jaundice, and respiratory distress syndrome. Long-term, these children are more prone to obesity, type 2 diabetes, and metabolic syndrome [5].

Addressing GDM requires a multidisciplinary approach, involving healthcare providers, nutritionists, and diabetes educators, to support the mother through education, dietary guidance, and medical interventions. Early diagnosis and proactive management are key to reducing adverse GDM outcomes. Public health initiatives aimed at raising awareness, promoting healthy lifestyles, and providing accessible healthcare services are vital to addressing GDM's growing prevalence and improving maternal and fetal health outcomes globally [6,7].

This study aims to evaluate the comprehensive impact of GDM on maternal health outcomes,

including GDM prevalence and risk factors, short-term pregnancy and delivery complications, and long-term health implications such as type 2 diabetes, cardiovascular diseases, and metabolic syndrome. It also examines various GDM management strategies, the relationship between GDM and fetal outcomes, and provides evidence-based recommendations for optimizing care. Emphasis is placed on the importance of postpartum follow-up and lifestyle modifications to mitigate long-term GDM risks.

### Materials and Methodology

**Study Design:** A prospective observational study assessing GDM's impact on maternal outcomes.

**Study Population:** The study included 200 pregnant women diagnosed with GDM.

**Study Duration:** The study spanned one year.

**Study Location:** Conducted at RMC Ajmer.

#### Inclusion Criteria:

- Pregnant women diagnosed with GDM in the second trimester via the oral glucose tolerance test (OGTT).
- Age 18-45 years.
- Singleton pregnancies.

#### Exclusion Criteria:

- Pregnant women with pre-existing diabetes (Type 1 or Type 2).
- Multiple pregnancies.
- Women with chronic conditions like hypertension, renal disease, or cardiovascular disease before pregnancy.

#### Data Collection: Data were gathered through:

1. Patient Interviews and Medical Records: Document demographic details, medical and obstetric history, and GDM diagnosis.
2. Clinical Assessments: Regular monitoring of blood glucose levels, blood pressure, and weight gain.
3. Laboratory Tests: Including fasting blood glucose, postprandial blood glucose, HbA1c levels, and other relevant tests.
4. Obstetric Outcomes: Mode of delivery, gestational age at delivery, and any delivery complications.

#### Management and Intervention:

##### Patients received standard care, including:

- Dietary Counselling: Personalized diet plans from nutritionists to manage blood glucose.
- Physical Activity: Exercise recommendations.

- Medical Management: Insulin therapy or oral hypoglycemic agents if necessary.

#### Outcome Measures:

##### Primary maternal outcomes included:

- Incidence of hypertensive disorders (e.g., preeclampsia).
- Mode of delivery (cesarean or vaginal).
- Postpartum complications like infection, hemorrhage, or ICU need.

##### Secondary outcomes included:

- Long-term follow-up for type 2 diabetes, metabolic syndrome, and cardiovascular diseases.
- Evaluation of maternal weight gain and postpartum weight retention.

**Data Analysis:** Statistical analysis was conducted using appropriate software. Descriptive statistics summarized demographic and clinical characteristics. Comparative analyses identified significant differences in outcomes between controlled and uncontrolled GDM groups. Multivariate analysis adjusted for confounding factors and determined independent predictors of adverse maternal outcomes.

**Ethical Considerations:** Approved by the Institutional Ethics Committee of RMC Ajmer. Informed consent was obtained from all participants, and patient confidentiality and data protection were strictly maintained.

#### Results

Among 200 pregnant women diagnosed with GDM, the mean age was  $30.2 \pm 4.5$  years. Most participants (70%) were between 25 and 35 years old. The prevalence of obesity (BMI > 30) was 35%, and 25% had a family history of diabetes.

#### Glucose Control:

- Controlled GDM: 60% (120 patients) maintained controlled blood glucose through diet, exercise, and/or medication.
- Uncontrolled GDM: 40% (80 patients) struggled to maintain target blood glucose levels despite interventions.

#### Obstetric Outcomes:

- Cesarean Section: 45% (90 patients).
- Vaginal Delivery: 55% (110 patients).

#### Gestational Age at Delivery:

- Preterm Birth (<37 weeks): 20% (40 patients).
- Term Birth ( $\geq 37$  weeks): 80% (160 patients).

#### Maternal Complications:

**Hypertensive Disorders:**

- Preeclampsia: 15% (30 patients).
- Gestational Hypertension: 10% (20 patients).

**Intrapartum and Postpartum Complications:**

- Postpartum Hemorrhage: 8% (16 patients).
- Infections: 5% (10 patients).
- ICU Admission: 3% (6 patients).

**Long-Term Follow-Up:**

At the 6-month postpartum follow-up:

- 25% (50 patients) developed impaired glucose tolerance.
- 10% (20 patients) were diagnosed with type 2 diabetes.
- 15% (30 patients) showed signs of metabolic syndrome.

**Weight Retention Post-Pregnancy:**

- Women with uncontrolled GDM retained an average of 5 kg.

- Women with controlled GDM retained an average of 2 kg.

**Statistical Analysis:**

- Cesarean Section Rates: Higher in uncontrolled GDM (60%) than controlled GDM (35%) ( $p < 0.05$ ).

- Hypertensive Disorders: More common in the uncontrolled GDM group (30%) versus the controlled group (10%) ( $p < 0.05$ ).

- Postpartum Weight Retention: Higher in the uncontrolled GDM group (5 kg) compared to the controlled group (2 kg) ( $p < 0.05$ ).

**Multivariate Analysis:**

- Independent predictors of adverse maternal outcomes included poor glucose control (OR: 3.5, 95% CI: 2.1-5.8), obesity (OR: 2.2, 95% CI: 1.3-3.7), and family history of diabetes (OR: 1.8, 95% CI: 1.1-3.0).

**Table 1 Clinical characteristic of Participants**

Characteristic	Total (N=200)	Controlled GDM (N=120)	Uncontrolled GDM (N=80)
Mean Age (years)	30.2 ± 4.5	30.1 ± 4.4	30.3 ± 4.6
Age Range (years)	18-45	18-45	18-45
BMI > 30 (%)	35%	30%	45%
Family History of Diabetes (%)	25%	20%	35%

**Table 2 Obstetric outcomes**

Outcome	Total (N=200)	Controlled GDM (N=120)	Uncontrolled GDM (N=80)
Cesarean Section (%)	45%	35%	60%
Vaginal Delivery (%)	55%	65%	40%
Preterm Birth (<37 weeks) (%)	20%	15%	30%
Term Birth (≥37 weeks) (%)	80%	85%	70%

**Table 3 Maternal complications**

Complication	Total (N=200)	Controlled GDM (N=120)	Uncontrolled GDM (N=80)
Preeclampsia (%)	15%	10%	25%
Gestational Hypertension (%)	10%	5%	20%
Postpartum Hemorrhage (%)	8%	5%	15%
Infections (%)	5%	3%	8%
ICU Admission (%)	3%	2%	5%

**Table 4 long-term follow-up outcomes**

Outcome	Total (N=200)	Controlled GDM (N=120)	Uncontrolled GDM (N=80)
Impaired Glucose Tolerance (%)	25%	15%	40%
Type 2 Diabetes (%)	10%	5%	20%
Metabolic Syndrome (%)	15%	10%	25%
Average Postpartum Weight Retention (kg)	3.5	2	5

**Table 5 Statistical analysis**

Comparison	OR (95% CI)	p-value
Cesarean Section (Uncontrolled vs. Controlled)	3.0 (1.8-5.0)	<0.05
Hypertensive Disorders (Uncontrolled vs. Controlled)	3.5 (2.1-5.8)	<0.05
Postpartum Weight Retention (kg) (Uncontrolled vs. Controlled)	2.5 (1.5-4.2)	<0.05

## Discussion

The study demonstrates the significant impact of GDM on maternal health outcomes during and after pregnancy. Uncontrolled GDM substantially increases the risk of adverse outcomes, highlighting the importance of stringent glucose management through diet, exercise, and medical interventions [8].

The findings indicate a high prevalence of obesity and family history of diabetes among participants, aligning with existing research that these are significant risk factors for GDM. The mean participant age was 30.2 years, consistent with the increased GDM risk in older pregnant women [9].

Notably, the rate of cesarean sections was higher in women with uncontrolled GDM (60%) compared to those with controlled GDM (35%), corroborating previous studies linking GDM with increased cesarean delivery likelihood due to complications like macrosomia and labor dystocia. The higher preterm birth incidence in the uncontrolled GDM group further emphasizes the need for rigorous glucose management to reduce early delivery risks and associated neonatal complications [10,11].

Uncontrolled GDM was also associated with higher rates of hypertensive disorders of pregnancy, such as preeclampsia and gestational hypertension. These conditions are known to contribute to maternal morbidity and mortality. The increased postpartum hemorrhage and infection rates in uncontrolled [12].

GDM group further highlights poor glucose control's broader impact on maternal health.

Long-term follow-up revealed that a significant proportion of women with GDM, particularly those with poor glucose control, developed impaired

glucose tolerance and type 2 diabetes within six months postpartum [13]. This supports existing evidence that GDM is a strong predictor of future diabetes. The increased prevalence of metabolic syndrome and significant postpartum weight retention in the uncontrolled GDM group further illustrate the long-term health risks associated with inadequate GDM management during pregnancy [14].

The study emphasizes the effectiveness of dietary counseling, physical activity, and medical management in controlling blood glucose levels and improving maternal outcomes. However, the high percentage of women with uncontrolled GDM suggests potential barriers to effective management, such as socioeconomic factors, adherence to treatment plans, or access to healthcare services [15,16].

**Recommendations:** Based on the findings, several recommendations can improve maternal outcomes for women with GDM:

1. Enhanced Screening and Early Intervention: Early identification of high-risk women and prompt initiation of management strategies can help mitigate adverse outcomes.
2. Comprehensive Management Plans: Multidisciplinary approaches involving obstetricians, endocrinologists, nutritionists, and diabetes educators are essential for providing personalized care.
3. Postpartum Follow-Up: Continued monitoring and support postpartum are crucial for early detection and management of long-term complications such as type 2 diabetes and metabolic syndrome.

4. Public Health Initiatives: Raising awareness about the importance of GDM management and promoting healthy lifestyle choices among pregnant women can help reduce the prevalence and impact of GDM [17,18].

### Conclusion

This study concludes that GDM significantly impacts maternal health outcomes, with uncontrolled GDM leading to higher rates of cesarean delivery, hypertensive disorders, and postpartum complications. Additionally, women with poorly managed GDM face increased risks of developing type 2 diabetes, metabolic syndrome, and significant postpartum weight retention. These findings underscore the critical need for effective GDM management through dietary counselling, physical activity, and medical interventions, as well as the importance of continued postpartum follow-up to mitigate long-term health risks. Comprehensive multidisciplinary approaches and public health initiatives are essential to improving maternal outcomes and overall health for women with GDM.

### References

- Ju, H., Rumbold, A. R., Willson, K. J., & Crowther, C. A. (2008). Borderline gestational diabetes mellitus and pregnancy outcomes. *BMC Pregnancy and Childbirth*, 8, 1-7.
- Dudhwadkar, A. R., & Fonseca, M. N. (2016). Maternal and fetal outcome in gestational diabetes mellitus. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 5 (10), 3317-3322.
- Casey, B. M., Rice, M. M., Landon, M. B., Varner, M. W., Reddy, U. M., Wapner, R. J., Rouse, D. J., Biggio, J. R. Jr., Thorp, J. M. Jr., Chien, E. K., & Saade, G. R. (2020). Effect of treatment of mild gestational diabetes on long-term maternal outcomes. *American Journal of Perinatology*, 37 (5), 475-482.
- Ye, W., Luo, C., Huang, J., Li, C., Liu, Z., & Liu, F. (2022). Gestational diabetes mellitus and adverse pregnancy outcomes: systematic review and meta-analysis. *BMJ*, 377.
- Dennedy, M. C., & Dunne, F. (2010). The maternal and fetal impacts of obesity and gestational diabetes on pregnancy outcome. *Best Practice & Research Clinical Endocrinology & Metabolism*, 24 (4), 573-589.
- Farrar, D., Fairley, L., Wright, J., Tuffnell, D., Whitelaw, D., & Lawlor, D. A. (2014). Evaluation of the impact of universal testing for gestational diabetes mellitus on maternal and neonatal health outcomes: a retrospective analysis. *BMC Pregnancy and Childbirth*, 14, 1-8.
- Reece, E. A. (2010). The fetal and maternal consequences of gestational diabetes mellitus. *Journal of Maternal-Fetal & Neonatal Medicine*, 23 (3), 199-203.
- Muche, A. A., Olayemi, O. O., & Gete, Y. K. (2020). Effects of gestational diabetes mellitus on risk of adverse maternal outcomes: a prospective cohort study in Northwest Ethiopia. *BMC Pregnancy and Childbirth*, 20, 1-3.
- Alia, S., Pugnali, S., Borroni, F., Mazzanti, L., Giannubilo, S. R., Ciavattini, A., & Vignini, A. (2019). Impact of gestational diabetes mellitus in maternal and fetal health: An update. *Diabetes Updates*, 5 (3), 1-6.
- Xiong, X., Saunders, L. D., Wang, F. L., & Demianczuk, N. N. (2001). Gestational diabetes mellitus: prevalence, risk factors, maternal and infant outcomes. *International Journal of Gynecology & Obstetrics*, 75 (3), 221-228.
- Srichumchit, S., Luewan, S., & Tongsong, T. (2015). Outcomes of pregnancy with gestational diabetes mellitus. *International Journal of Gynecology & Obstetrics*, 131 (3), 251-254.
- Kim, C. (2014). Maternal outcomes and follow-up after gestational diabetes mellitus. *Diabetic Medicine*, 31 (3), 292-301.
- Wahabi, H. A., Fayed, A. A., Alzeidan, R. A., & Mandil, A. A. (2014). The independent effects of maternal obesity and gestational diabetes on the pregnancy outcomes. *BMC Endocrine Disorders*, 14, 1-7.
- Saravanan, P., Magee, L. A., Banerjee, A., Coleman, M. A., Von Dadelszen, P., Denison, F., Farmer, A., Finer, S., Fox-Rushby, J., Holt, R., Lindsay, R. S. (2020). Gestational diabetes: opportunities for improving maternal and child health. *The Lancet Diabetes & Endocrinology*, 8 (9), 793-800.
- Martin, K. E., Grivell, R. M., Yelland, L. N., & Dodd, J. M. (2015). The influence of maternal BMI and gestational diabetes on pregnancy outcome. *Diabetes Research and Clinical Practice*, 108 (3), 508-513.
- Catalano, P. M. (2010). The impact of gestational diabetes and maternal obesity on the mother and her offspring. *Journal of Developmental Origins of Health and Disease*, 1(4), 208-215.
- Ovesen, P. G., Jensen, D. M., Damm, P., Rasmussen, S., & Kesmodel, U. S. (2015). Maternal and neonatal outcomes in pregnancies complicated by gestational diabetes. A nationwide study. *Journal of Maternal-Fetal & Neonatal Medicine*, 28(14), 1720-1724.
- Prakash, G. T., Das, A. K., Habeebullah, S., Bhat, V., & Shamanna, S. B. (2017). Maternal and neonatal outcome in mothers with gestational diabetes mellitus. *Indian Journal of Endocrinology and Metabolism*, 21(6), 854-858.